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Original Research Paper

Antihyperlipidemic Activity of Ethanolic Extract of Celery Leaves on Rats *Rattus norvegicus*

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ABSTRACT

India has about 45000 plant species; while medicinal properties have been assigned to several thousand. *Apium graveolens* (Celery) belonging to family Apiaceae, used as a decorative herb in India in general and more particular in Punjab and Uttar Pradesh. Celery roots, leaves, stem, oils and seeds are used for the therapeutic purpose in treating and preventing many diseases. In the present study the effect of celery on cholesterol induced rats was studied. Ethanolic extract of celery leaves was orally administered by post treatment at the dose level of 500mg/kg of body weight for 7th, 14th, 28th and 56th days respectively. Administration of cholesterol induced rats resulted in increased total cholesterol, triglycerides, LDL, VLDL and decreased the HDL cholesterol. Administration of celery extract resulted in HDL cholesterol increase and decrease in the total cholesterol, triglycerides, LDL and VLDL in duration dependent manner. The above finding proved that 56th day treatment of ethanolic extract of celery was found to have more protective effect on lipid profiles in cholesterol induced rats. The results of the above studies are discussed in the light of recent literature.

INTRODUCTION

In recent times, focus on plant research has increased all over the world and large body evidence has corrected to immense potential of medicinal plants used in various traditional system. India has about 45,000 plant species; while medicinal properties have been assigned to several thousand. Celery *(Apium graveolens)* belonging to family Apiaceae. Review of the literature indicates that celery has been cultivated for the last 3,000 years (Momin & Nair 2001). It is rich source of vitamin C and dietary fibre, potassium, folate, manganese, vitamin B6, calcium, vitamin B1, vitamin B2, magnesium, vitamin A, phosphorus and iron were also present (Mitra et al. 2001).

According to Zahra et al. (2011), celery consists of twenty two volatile compounds. It has been extensively studied for its biological activities. Aqueous extract of celery stem caused significant reduction in serum total cholesterol level in hypercholesterolemic rats (Tsi & Tan 2000). Nitrogenous compounds from essential oil of celery seed have been reported to have effect on the central nervous system (Al Hindawi et al. 1989). Celery posses anti-inflammatory effect (Momin & Nair 2002), and celery juice showed protective effect when applied with doxorubicin (Kolarovic et al. 2009). It is an aromatic biennial herb, almost the whole plant is used, including the roots, seeds, leaves, and oil. It is a bitter herb with a pleasant smell that relieves indigestion, reduces inflammation, and acts as a mild diuretic (Newall et al. 1996). In Germany, celery preparations are used to treat loss of appetite, general and nervous exhaustion (Wren 1988). Some pharmacological effects of celery have been reported, such as vasodilatory action in rat thoracic aorta (Ko et al. 1991) and mosquito repellent (Tuetun et al. 2004). Sultana et al. (2005) reported that celery is a potent plant against experimentally induced hepatocarcinogenesis in Wistar rats. In the present study, the effect of celery leaves extract on cholesterol induced toxicity in rats was studied.

MATERIALS AND METHODS

Plant processing: Celery was purchased from the local market (Chennai). The celery leaves were shade dried, finely powdered and subjected to Soxhlet extraction for 30 hours using ethanol as solvent. The extract was filtered and concentrated to dryness under low temperature (40°C) and reduced pressure. The extract was used for the study.

Cholesterol: Cholesterol was purchased from Sisco Research Laboratories Pvt. Ltd., Bombay, India.

Animal model: Animals were housed, fed and treated in accordance with the in house guidelines for animal protection to minimize pain and discomfort. Adult male wistar rats weighing about 175-200g each were used throughout the study. The animals were left for seven days to adapt to the room conditions (temperature, humidity, light and dark period, aeration and caging).

Treatment: Male wistar rats were divided into seven groups (n = 6). Group I served as control, group II served as vehicle control administered with vehicle only (2mL of hydrogen-

ated groundnut oil). Group III cholesterol control where in 500mg/kg body wt. of cholesterol in 2mL of hydrogenated groundnut oil was administered for 30 days, the treatment of Group IV, V, VI and VII rats were fed with 1mL of ethanolic extract of celery leaves of 500mg/kg of body weight for 7th, 14th, 28th and 56th days respectively.

Collection of blood: At the end of the experiment after 12-14 h of fasting blood samples were drawn from rats in plain tube, allowed to clot and were centrifuged to obtain serum. The serum was stored at -20°C for biochemical analysis.

Determination of serum lipid profile: Serum lipid profile, including total cholesterol (TC) and triglycerides (TG) were colourimetrically determined (Allain et al. 1974, Wahlefeld 1974), high-density lipoprotein cholesterol (HDL-c) was colorimetrically determined, low-density lipoprotein cholesterol (LDL-c), and very low-density lipoprotein cholesterol (VLDL-c) were mathematically calculated (Friedewald et al. 1972).

Statistical analysis: The data obtained from various studies were subjected to statistical analysis using SPSS package. Student's 't' test was applied for the studies. They are expressed as the mean ± SD and the differences between groups were statistically analysed using one-way analysis of variances (ANOVA).

RESULTS AND DISCUSSION

India is blessed with a wide variety of plants, which are classified under various categories such as angiosperms, gymnosperms and pteridophytes, etc. Of them leaf, stem and root form important parts, the stem and root are considered unwanted by people and most of them are eliminated without understanding their role in physiology or their important uses in the field of herbal medicine.

Every plant on the earth is useful to humans, animals or other organisms and according to Valiathan (1998) plants are generally considered to be less toxic and free from many of the side effects that a synthetic drug may exhibit.

Herbal preparation has been used in many parts of the world since ancient times. In recent years, their popularity has gained importance, as a alternative to modern medicine even in developing countries (Maurya et al. 2004).

On feeding normal rat with cholesterol significantly increases the level of total cholesterol, TGL-c, LDL-c, VLDL-c and decrease the HDL-c. On feeding of ethanolic extract of celery leaves it increased the HDL-c and at the same time it remarkably decreases the total cholesterol, TGL-c, LDL-c and VLDL-c when compared to the control experimental animal. Better results were obtained in 56th

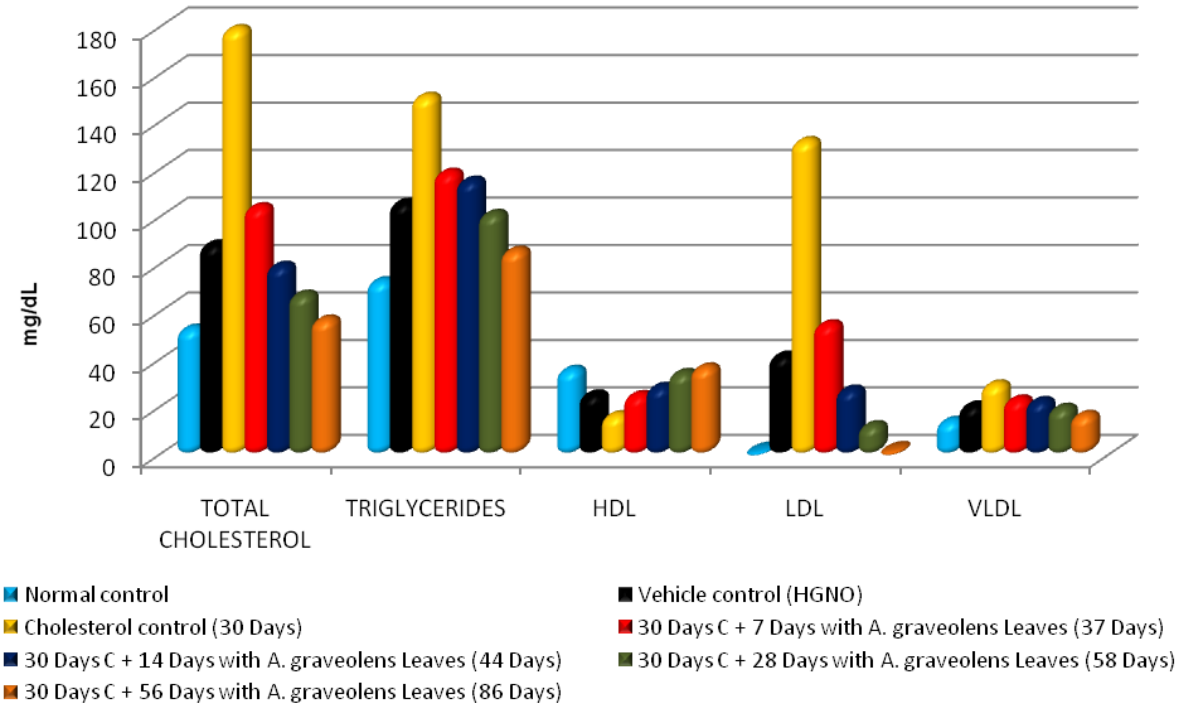

Table 1: Effect of *Apium graveolens* leaves on lipid profiles in the blood of rats *Rattus norvegicus.*

Table 1: Effect of ethanolic extract of *Apium graveolens* leaves on lipid profiles in the blood of rats *Rattus norvegicus.*

	Total cholesterol	Triglycerides	HDL	LDL	VLDL
Normal control	53.17 ± 2.56	73.17 ± 3.97	35.83 ± 2.64	2.33 ± 0.82	14.33 ± 0.82
Vehicle control (HGNO)	88.67 ± 3.83 ^{a***}	106.17 ± 4.54 ^{a***}	25.50 ± 3.08 ^{a***}	41.83 ± 0.75 ^{a***}	20.83 ± 0.75 ^{a***}
Cholesterol control (30 days)	179.33 ± 2.80 ^{a***}	150.83 ± 5.00 ^{a***}	16.67 ± 2.58 ^{a***}	132.17 ± 1.72 ^{a***}	29.67 ± 1.21 ^{a***}
30 Days C + 7 days with *A. graveolens* leaves (37 days)	104.33 ± 2.73 ^{b***}	118.83 ± 3.76 ^{b***}	25.17 ± 2.48 ^{b***}	55.00 ± 1.41 ^{b***}	23.33 ± 0.82 ^{b***}
30 Days C + 14 days with *A. graveolens* leaves (44 days)	79.67 ± 1.63 ^{b***}	115.50 ± 3.94 ^{b***}	28.67 ± 4.32 ^{b***}	27.50 ± 4.72 ^{b***}	22.67 ± 0.82 ^{b***}
30 Days C + 28 days with *A. graveolens* leaves (58 days)	67.50 ± 4.76 ^{b***}	101.50 ± 2.88 ^{b***}	34.50 ± 2.88 ^{b***}	12.50 ± 5.68 ^{b***}	19.83 ± 0.75 ^{b***}
30 Days C + 56 days with *A. graveolens* leaves (86 days)	57.00 ± 3.10 ^{b***}	86.00 ± 3.85 ^{b***}	36.83 ± 1.17 ^{b***}	2.67 ± 1.63 ^{b***}	16.83 ± 0.98 ^{b***}

A. graveolens – Apium graveolens; HDL-High density lipoprotein; HGNO-Hydrogenated groundnut oil; C-Cholesterol, LDL-Low density lipoprotein, VLDL-Very low density lipoprotein.

Values represent mean ± SD of six animals; a-denotes parameters are compared to control rats, b-denotes parameters are compared to cholesterol control rats; NS - Non-significant, * P<0.05, ** P<0.01, *** P<0.001.

day of treatment with 500 mg/kg celery than the 7th, 14th and 28th day treated animal (Table 1 & Fig. 1). The results suggest that the lipid lowering action of this natural product maybe reduction of lipid absorption in the intestine, such a result has also been obtained by Daniel Tsi & Benny Tan (2000) while using aqueous celery extract fed for 8 weeks after weaning, which significantly reduced the serum TC concentration of growing RICO rats. The reason for decrease in levels of total cholesterol, triglycerides, LDL and VLDL may be due to the short-chain fatty acids produced through the fermentation of soluble fibre by celery.

The exact mechanism by which the plant extract induce weight loss is not well known. However, several studies have shown that agents could cause body weight reduction through several proposed mechanisms. These include: stimulation of the mobilization, inhibition of lipoproteins lipase activity, increasing energy expenditure, inhibition of absorption of nutrients from the gastrointestinal tract, suppression of the appetite, and reduction of food intake (Dyer 1994, Angelica 1998), which could have reduced the body weight, may be dissolving the lipids.

The study shows that ethanolic extract of celery leaves has antihyperlipidemic effect and could be of value in reducing serum total cholesterol, triglyceride, LDL-c, VLDL-c and increasing HDL-c.

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